Amendment under 37 CFR §1.116
Application No. 10/615,193
Attorney Docket No. 000138A

REMARKS

Rejections under 35 USC §103(a)

Claim 5 was rejected under 35 USC §103(a) as being unpatentable over Sugiura et al. (U.S. Patent No. 5,638,889).

Claim 5 has been amended for clarification to recite as follows:

> 5. A process for heating a thixocast Fe-based alloy material having a chilled structure into a semi-molten state in which solid and liquid phases coexist, the process comprising:
> heating said **Fe-based alloy material having a chilled structure** from a room temperature to a point A_1 in an Fe-C based equilibrium diagram, wherein an average rate H_R of heating is set to be in a range of $0.5°C/sec \leq H_R \leq 6.0°C$ /sec, and a maximum temperature gradient T_G of the inside of the Fe-based alloy material per unit distance is set to be at $T_G \leq 7°C/mm$; and
> further heating said Fe-based alloy material into a semi-molten state in which solid and liquid phases coexist.

There is no new issue because amended claim 5 only recites the subject matter which was already recited in the claim before claim 5 in a clearer manner.

The Examiner alleged that "The heated billet temperature of cited reference is uniform which meet instant claimed temperature gradient up to 7°C/mm." However, the allegation is not correct. Sugiura et al describes as follows:

> The heating of the billet 11 is carried out, according to the heating curve of FIG. 12, in an inactive atmosphere by high frequency induction heating or low frequency induction heating. That is, it is heated at relatively high speed until its temperature is raised from ordinary temperature to a temperature A (470°C.) corresponding to the solidus, and **then heated at relatively slow speed until its temperature reaches a temperature B (560°C.). As a result, the difference in temperature between the inside**

> **and the outside of the billet B is zeroed;** that is, the billet B is uniform in temperature as a whole, and is held semi-molten, thus being suitable for forging. In the billet at this temperature, the fraction of the liquid phase component is about 46%. Thereafter, the billet is heated at a slightly higher speed to a temperature C (580°C.), and held at the temperature C. In the billet at the temperature C, the fraction of the liquid phase component is increased to 65%. The heating curve passing through the temperatures A, B and C in FIG. 12 may be made dull as indicated by the two-dot chain line.

(Col. 14, lines 37-55). The billet B is uniform in temperature as a whole because the billet is heated at relatively slow speed from temperature A to B. The billet is held semi-molten at temperature B. Sugiura et al does not discuss the homogeneity in temperature in the billet while the billet is heated to temperature A. The fact rather indicates that there is significant temperature difference than homogeneity in temperature while the billet is heated to temperature A.

Moreover, Sugiura et al discusses an aluminum alloy containing 11% silicon by weight and a magnesium alloy containing 8% aluminum by weight and 1% zinc by weight, but does not teach or suggest about thixocast Fe-based alloy material having a chilled structure.

The present invention is directed to a process for heating thixocast Fe-based alloy material having a chilled structure into a semi-molten state and solves problem which is **particular to a process of heating thixocast Fe-based alloy material having a chilled structure.** The problem is related to the fact Fe-based alloy has a eutectoid or precipitation point. In Sugiura, however, the materials have no such eutectoid or precipitation point.

By controlling the average rate H_R of heating to a point A_1 and the maximum temperature gradient T_G, the cracking due to the chilled structure can be prevented. Also, the oxidation of the material and the coalescence of crystal grains can be prevented.

For at least these reasons, claim 5 should patentably distinguish over Sugiura et al.

Claim 6 was rejected under 35 USC §103(a) as being unpatentable over Sugiura et al. (U.S. Patent No. 5,638,889) in view of acknowledged prior art admission.

Claim 6, depending from claim 5, also patentably distinguishes over Sugiura et al. The acknowledged prior art admission has been cited regarding the ultrasonic velocity. However, such disclosure of the acknowledged prior art admission does not remedy the deficiencies of Sugiura et al discussed above.

For at least these reasons, claim 6 patentably distinguishes over Sugiura et al and the acknowledged prior art admission.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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